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Strategic Asset Allocation for the Norwegian Investor

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Abstract

Our preliminary thesis will be serving as a starting point for the Master Thesis. We study strategic asset allocation amongst Norwegian/Nordic investors. In the preliminary thesis, we will have relevant literature, methodology, research objective, data collection, and a thesis progression plan.

Introduction and background

Investors have problems of allocating their funds to generate returns on their investments with multiple asset classes available. There is no easy job to create a portfolio for the long investment horizon. Short time investing often has different purposes and methods. A portfolio is the collection of financial assets and investments that are held by investors. Strategic asset allocation is the decision to distribute the funds in the portfolio among possible asset classes to meet their investment goals. Strategic asset allocation is the systematic approach to creating a portfolio across broad asset classes such as stocks, bonds, cash, commodities, real estate, and so on. Stocks can be divided into domestic and foreign, large-cap and small-cap, value and growth, dividend paying, developed and emerging-markets etc. Bonds can be divided into Treasury, municipal, developed and emerging markets, investment-grade and high-yield bonds. In addition, investors have access to real estate, commodities, cryptocurrency, private equity, hedge funds etc. that can be argued to be own asset classes. Thus, some argue that financial assets can be divided into multiple asset classes because different characteristics and use in a portfolio.

Shifting and replacing assets and investment styles can be helpful for the investor because they go in and out of favour throughout time as history has illustrated. The purpose of asset allocation is developing a plan that is appropriate for the risk aversion and investment horizon of the investor. Often, the investor needs to choose the trade-off between risk and return. Asset allocation is the choice of how much of the investor's portfolio should be distributed among the investment classes. Thus, it is expected to optimise and make the trade-off as attractive as possible for the investor.

Portfolio creation is divided into asset allocation and security selection, where the latter is the choice of which security, within each asset class, should be included in the portfolio. Thus, the decision of asset allocation can have a great impact on the portfolio's return. Asset allocation can be divided into asset allocation policy and active asset allocation (Brinson, Singer & Beebower, 1991). Asset allocation policy is the creation of portfolios based on normal asset weightings, while active asset allocation is the temporarily deviation of the asset weightings from the policy to enhance the risk and return tradeoff. The objective of active asset allocation is to

enhance the return or reduce the risk of the portfolio relative to the normal policy benchmark. Asset allocation has more importance on the total return of the investment portfolio than the security selection and timing of the trades, because the average investor do not beat the market with the latter (Brinson, Singer & Beebower, 1991; Ibbotson & Kaplan, 2000).

One of the great benefits of asset allocation stem from effects of diversification (Levy & Sarnat, 1970). Diversification can reduce risk without negatively affect expected returns. The risk of the portfolio stems from the weighted risk of individual securities within the portfolio. Stocks hold systematic and firm-specific risk, where the latter can be diversified away. Risk, measured by standard deviation, cannot be eliminated due to systematic risk that assets, especially equity, endure. The portfolio standard deviation decreases as number of securities increase, if the correlation between securities is lower than one. When two assets have a correlation of 1, they are perfectly correlated and there are no diversification benefits from include them in the portfolio, as they move together in all market conditions.

Reducing the risk, and holding the returns constant, increase the risk-return trade-off of the portfolio (Markowitz, 1952). Diversification is viewed by Harry Markowitz as the only "free lunch" in finance. Thus, it is often preferable to increase the number of securities in the portfolio if it has low correlation with the existing assets that can reduce the overall risk of the portfolio. Asset allocation works because the securities and assets have different return and risk characteristics, and when one asset performs poorly others may not. A portfolio with appropriate asset allocation can smooth out the movements in the market. Lower portfolio risk generally provides smaller decreases in market turmoil than portfolios with higher risk, which makes it recover more quickly.

Investors can consider the capital allocation line (CAL) when deciding how the asset allocation can be optimised. The capital allocation line visualises the highest Sharpe ratio, the excess return-risk ratio, of portfolios of securities. Usually, investors can use the Sharpe ratio as a measure that maximises the asset allocation of the portfolio by introducing the other asset classes. The objective of maximising Sharpe is through finding the weights of the asset classes in the portfolio that increase the slope of the capital allocation line. Individual securities tend to have higher risk than a composition of multiple securities. Thus, an optimal asset

allocation between multiple asset classes can produce higher Sharpe ratio than individual securities.

Many have questioned the early theories of portfolio construction, especially Markowitz' modern portfolio theory (Markowitz, 1952), after the financial crisis when correlation between assets increased. Levy and Sarnat (1970) have argued for international diversification due to low correlation between international stocks and US stocks, but due to increasing correlations across markets the benefits of diversification is weakening. Increased correlation weakens the effects of diversification. However, diversification is still important if the movements of the securities are not perfectly correlated. Lately, financial markets have experienced increased external shocks that exaggerate the increases in equity correlations. These major events such as the 2007-08 financial crisis, European debt crisis, natural disasters etc., create financial damages across continents due to global interconnectivity from globalism. External shocks cause unpredictable price fluctuations abroad to affect domestic markets. Lately, bond yields have been on decline making them less attractive as investment vehicles. A low interest rate environment creates problems for pensioners nearing retirement. Various weaknesses in traditional strategic asset allocation, which was shown during the 2007-08 financial crisis, have led many institutional investors to look at alternatives to mainstream approaches to asset allocation. Due to changing market conditions traditional asset allocation needs to be revisited to account for the new environments with smarter strategies. Portfolio construction can go beyond equities and fixed income with a wider universe of investable assets to account for changing economic environments. The question is whether alternatives work better in practice than the modern portfolio theory.

The need and ability to save for future increases the demand for sophisticated investment management. Large financial markets and increased number of financial instruments and assets put professional and institutional investors at advantage above retail investors. Sophisticated investors have the ability to employ complex strategies much more efficiently than retail investors. Often capital and knowledge are required to take advantage and create access to asset classes outside of equities and bonds. Thus, optimising the portfolio needs to be layered into multiple components. Retailers might acquire sophisticated investment procedures through

services offered by professional managers, but usually at high prices, making net-returns lower or indifferent from cheaper, passive strategies and portfolios. There has not been a wide range of literature in this matter for the point of an investor based in Norway or the Nordic region, as most research uses data for the American indexes. It depends if it really matters where the investor is positioned. Thus, it might be interesting to research these topics.

Research question and objective of thesis

It is obvious that it would be beneficial for investors to maximise their returns based on available asset classes. There has not been that many studies based on the most common asset classes divided to alternative, foreign, domestic, long-term, and short-term securities, in Norway. Thus, the objective of this thesis is to develop a strategy or portfolio that can maximise the risk-return trade-off with focus on strategic asset allocation specifically for Norwegian investors, either theoretical or practical. Investors have wide access to most asset classes that can be embedded in their portfolios including foreign, domestic stocks, foreign bonds, domestic bonds, long-term bonds, short-term bonds, government bonds, corporate bonds, cash, commodities, and real estate. Are there any strategies available that can be implemented by Norwegian investors? What kind and proportion of assets should or can be included in a Norwegian investor's portfolio, and how can this be implemented? How often do these strategies have to be rebalanced? What is the risk tolerance, and how can investor use it in the portfolio selection and asset allocation? Does the portfolio or strategy look like the US investor, where most of current research is based on? These are some of the questions we ought to answer in this thesis with focus on the strategic asset allocation in the Nordic region. In sum, our research topic is strategic asset allocation in the long-run for the long-term Norwegian investor.

It is difficult to create an optimal portfolio that ignores the investor's preferences. Optimal portfolios vary based on portfolio constraints of dividend-yield requirements, tax considerations, risk aversion, and so on (Bodie et al., 2016). Not all ideas are appropriate for all investors due to different tax considerations, investment horizons, goals, investable assets, individual preferences and other factors. Thus, we must decide whether to create multiple portfolios that meet multiple criteria or stick to one single portfolio that investors can change exposure

to the portfolio against the risk-free asset. This portfolio is supposed to maximise the expected return, and it aim to outperform other portfolios with similar goals. Investors have different preferences, thus, arguing the optimal portfolio is the best for investors would be a fallacy. The portfolios should consider risk aversion, investment horizon, and purpose. Risk-aversion determines the construction and allocation of the assets within the portfolio. In most cases, the optimal expected return maximising portfolio, with higher risk, will outperform the conservative portfolios in the long-term, but the losses it endures would be greater than the conservative portfolio (Campbell & Viceira, 2000). Thus, we need to create assumptions that can be used to produce optimal portfolios for the average investor without over-restrictive constraints. Constraints in an optimisation model would make the portfolio most often inferior to unconstrained portfolios.

Institutional investors tend to have a wider access to knowledge and resources to utilise investment strategies. These strategies include the Endowment model, Liability-Driven Investment, Risk Parity approach, Permanent portfolio, and so on. However, retail investors tend to have shorter investment horizons, higher transaction costs, and limited access to the alternative investments and information. The most common asset allocation strategies for retail investors entail diversification, risk-budgeting and goal driven investment models (Davidow & Peterson, 2017; Faber, 2015).

Literature review

There have been conducted multiple studies regarding asset allocation, but very few of them address strategic asset allocation in the Nordic region. Most of the available literature studies equities and bonds in the US region.

Levy and Sarnat (1970) looked at how the correlation of assets can reduce the risk of the portfolio through diversification. The authors calculated the expected return and standard deviation for 28 countries between 1951 and 1967. The number of countries were reduced from 28 to 9 countries in the optimal portfolios as negligible proportions of the investments are allocated to the excluded countries. A large share of the portfolio was allocated to developing countries with low or negative correlations. The United States holds a large position in the optimal portfolio due to its high rate of return and moderate level of risk. On the other side, the results

from Levy and Sarnat (1970) might not be mirrored in a portfolio for the Nordic or Norwegian investor.

Liljeblom, Löflund, and Krokfors (1997) research the magnitude of international diversification from the Nordic point of view, whether the changes in correlation between Nordic and foreign stock markets add any benefits for holding international assets. The authors examined diversification outside of the Nordic countries with ex ante diversification strategies, and measured the co-movements of stock markets and currency pairs. The findings indicate that there were increased co-movements between the Nordic and international stock markets in the chosen sub periods. Increasing correlation between asset classes reduce the benefits of diversification. Despite increasing co-movements between markets, international diversification is still beneficial for the Nordic investor.

Bessler, Opfer and Wolff (2017) compared the multi-asset portfolio optimisation using the Black-Litterman model versus mean-variance and naïve diversification. The naïve diversification in this paper is related to the equal weighted (1/N) multi-asset portfolio. The Black-Litterman model aims to overcome the problems of estimation through the mean-variance model. The authors test out-of-sample performance relative to the other models, and find that the Black-Litterman optimised portfolio outperform the others with higher Sharpe ratios after controlling for different levels of risk-aversion and portfolio constraints.

Black and Litterman (1992) combined Markowitz' mean-variance optimization model and the CAPM of Sharpe and Lintner, in order to find an optimal global portfolio. The authors suggests an approach where investors view about global equities, bonds, and currencies is combined with the risk premiums generated by the CAPM equilibrium. They argued that when investors have no views about currencies or assets they might use equilibrium risk premiums as a neutral reference point for expected returns. By combining investor views and market equilibrium, with the assumption that both are uncertain and can be expressed as probability distributions, they can find the future excess returns. In order to control their portfolio, they look at how similar the portfolio is to the global equilibrium portfolio, a portfolio where 80% of the currency risk is hedged. As benchmarks, the authors suggests to either use the volatility of excess returns as measure of risk, or specifying a portfolio that represents the desired allocation of assets in the absence

of views. To test whether or not the global portfolio beats the domestic portfolio, the authors use three different portfolios: bonds only, equities only, and a combination of both. The finding shows that all three portfolios beat the domestic ones, and in the case where they consider currency hedging, the bonds only portfolio beats the domestic portfolio by almost 50%, showing that there is a clear advantage of using a global portfolio instead of a domestic portfolio.

Data collection

To answer the research question, we will rely on quantitative data. The quantitative data we will be using we will be getting from sources like DataStream. Appropriate data should be good proxies for any of the given assets. For the stocks, we might use indexes for large stock exchanges around the world broad indexes from MSCI, Russell, JP Morgan, and Barclays may suffice. The indexes must be consistent, i.e. stock index of capital gains with reinvested dividends or bond index of capital gains with income. Alternatively, we can use the various databases available at BI financial data center to compile our own indexes if needed. Historic data related to the asset classes, especially equity, is often easily obtainable through databases like CRSP, Bloomberg, or Eikon. Regarding the nature of the topic asset allocation, we believe we would not have many difficulties finding appropriate data for most of the research. We will mainly search for basic asset prices and returns with not complex characteristics.

We also need to find the appropriate time length for the data we are going to use. Using a too short time frame means we will not be able to take previous financial crises into consideration, which could have great impact on our model. On the other side, some of the indices does not stretch back to the early dates. Ideally, we should be able to test whether we get different results by using different start dates and time intervals for the historical data of asset returns. We will then be able to observe theories and models that have been suggested and/or tested out, and adopt them into our own research.

Methods and thesis progression

After gathering all data, we should structure the data in the same time frame. We need to decide how many years are sufficient, and what kind of data we need, i.e. daily, weekly, monthly, quarterly, or annually data. Furthermore, we need measures for expected returns and yields of fixed-income assets. Risk of assets can be estimated using historical data or forecasting. Then we can start using summary statistics and tables to illustrate the historical returns, risk, and characteristics of the asset classes over longer and shorter time intervals. The data needs to be adjusted to local currency, as currencies affects the returns of the domestic investor, especially when investments are made abroad. Some of the financial databases provide this service. The assets' correlation needs to be studied to determine assets' inclusion in the portfolio for diversification benefits. We can study the asset correlations and asset allocations during different market conditions and periods. Portfolio creation and asset allocation are determined by the risk-aversion of the investor, so we must create multiple portfolios depending on the goals and risk profile of the investor. Additionally, most investing has goals attached, and we need to decide the goals of the investor, as it is very difficult, or even impossible, to create one single portfolio or strategy for most investors.

We can impose certain investment and portfolio constraints to assess the robustness and sensitivity of the portfolio or strategy. Regarding the level of risk-aversion, we can either use different scalars or volatility constraints that are often used in practice by investors. Often, investors can determine their maximum drawdown that they can handle for investment advisory products. These levels of maximum drawdown are often determined according to the risk preference of the investor, such as 5%, 10%, and 20%. Additionally, we can introduce transaction costs related to turnover or the active and dynamic asset allocations. Thus, we must find the average transaction costs for the Norwegian investor. Naturally, shorting would be restricted in this portfolio, but the model can relax the shorting assumption. These could be limitations for the optimisation problems.

Finally, after creating the model, it should be tested against alternative strategies and reference benchmarks, value-at-risk, how the portfolios behave during different market conditions, and statistical testing. We can offer full evaluation of the strategy or portfolio by dividing the sample into several sub-periods to test the behaviour

during different expansionary and recessionary environments. We might decide whether we should try out-of-sample or in-sample testing. It would perhaps be necessary for us to run simulation studies as historical data would not be feasible for the future. The simulation studies must rely on measures for expected returns and estimated for risk. The most difficult part of the thesis would be related to the creation, implementation and tests of the portfolio or strategy. It would be difficult to find a strategy and convert it to R code.

One model we can look closer at is the Black-Litterman model. The Black-Litterman model have the advantage that combines two other well-known models, the mean-variance and the CAPM, while also taking the investors views about the future into consideration. Black and Litterman (1992) came up with the following mathematical expressions for expressing the investors view:

$$P * E(R) = Q + \varepsilon$$

Where P is a given k*n matrix, E(R) is the expected returns of the assets, Q is a vector that represents the difference between the returns, ε serves as an unobservable, normally distributed random variable with mean zero and variance Ω. Ω in this case is uncertainty in the view (in the case of several views, Ω works as a covariance matrix). He and Litterman (1999) further explains how combining the views with the CAPM framework gives a result which states that the expected returns are distributed $N(\mu, M^{-1})$ where μ serves as the mean and M^{-1} as a covariance matrix. More specifically, μ is expressed as:

$$\mu = [(\tau\sum)^{-1} + P'\Omega^{-1}P]^{-1}[(\tau\sum)^{-1}\prod + P'\Omega^{-1}Q]$$

μ will serve as the vector of expected excess returns, $\prod$ works as the equilibrium risk premiums, and $\tau\sum$ works as a covariance matrix where τ is a constant. Further, M^{-1} is given by:

$$M^{-1} = [(\tau\sum)^{-1} + P'\Omega^{-1}P]^{-1}$$

Thus, this gives arise to the Black-Litterman asset allocation model (Black & Litterman, 1992; He & Litterman, 1999).

However, the Black-Litterman has its shortcomings. For instance, it only allows the investors to specify their views about the asset returns, and not the volatility. As it relies on the mean-variance model, it uses variance as the risk factor, but does not take for instance value at risk (VaR) or conditional value at risk (CVaR) into consideration. Bertsimas, Gupta, and Paschalidis (2012) explains one way to solve this, where they do an inverse optimization of the Black-Litterman model, letting the investors be more flexible when specifying their views, as well as taking several different risk factors into consideration. They simply add a mean-variance inverse optimization (MV-IO) approach, and a robust mean-variance inverse optimization (RMV-IO) approach to the Black-Litterman model. They argue that the difference in the two approaches is that the MV-IO approach gains the investors when they have private information about the volatility, while the RMV-IO approach can be used when the investor does not have any information about the volatility.

We need to put down our assumptions for a practical or theoretical approach. A practical approach need to consider the availability of asset classes to the Norwegian investors, transaction fees, and implementation, while a theoretical approach can ignore many of the restrictive assumptions limiting the strategy. Most of the discovery and development of the strategy or portfolio will be conducted in the statistical package R, where we would implement existing codes or creating our own depending on the availability of such codes or packages online. R is easy to use, and it can import and convert data from several sources. Packages such as "PortfolioAnalytics" and "ggplot2" could be useful in our research and presentation.

For the rest of this semester, we will continue with the exploration of strategies and portfolios that has already been tested, as well as finding models that can be used in our strategy. We will also find one or more benchmarks that we can test our strategy up against. We will then test this new strategy up against the different benchmarks that we have, such that we can conclude whether or strategy is better than the benchmarks. Alternatively, we will focus on implementing a strategy that is known to be working abroad, but instead test it on the Norwegian market. Our goal is to be finished with the quantitative part within June, such that we can assemble and finish the thesis within July/August, so we have it ready for submission before September 3rd.

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